

## Bay Area Dioxins Project

# Why Are Hospitals Rethinking Regulated Medical Waste Management?

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### Hospitals Lose Money Due to Regulated Medical Waste Management Costs

*Simple management changes recoup 10% to 50% of costs (and reduce pollution)*

About 90% of California hospitals currently manage essentially all of their regulated medical waste off-site. Until recently, the majority of these wastes have been managed by incineration. If your hospital is still incinerating its regulated medical waste, now is a good time to rethink that decision because:

- **Incineration is expensive and prices are going up**—Vendor consolidation and the December 2001 closure of California's only commercial medical waste incinerator are greatly increasing costs for incinerating medical waste. Increased federal regulation, additional incinerator closures, public pressure against incineration, and skyrocketing fuel costs will likely keep incineration prices on the rise. Because of this, a 250-bed general acute care hospital now spends more than \$100,000 per year to have an outside vendor incinerate its regulated medical waste. **Switching to an alternative off-site treatment (for waste not legally requiring incineration) could immediately save a hospital 10-20%; switching to an on-site autoclave saves 50%.**
- **Poor waste segregation = wasted money**—Throwing away non-contaminated waste into the regulated medical waste stream (red bags) may increase regulated medical waste volumes by as much as 50%! Encouraging proper waste segregation and selecting products that don't wind up in the trash can safely reduce regulated medical waste volumes and save 40 to 70% on waste disposal.
- **Incinerators emit dioxins and mercury**—Medical waste incinerators are one of the nation's leading emissions sources of persistent, toxic, bioaccumulative pollutants like dioxins and mercury. And that's not all—the diesel trucks that haul regulated medical waste long distances to incinerators also emit toxic pollutants. **Exposure to these pollutants threatens public health.**
- **Better alternatives exist today**—To reduce costs, many hospitals are now switching to alternative off-site services such as **autoclaving** (available statewide) and **microwaving** (available in Southern California only). (Almost all California hospitals continue to send pathological, chemotherapy and pharmaceutical wastes off-site for incineration, which has until recently been the only legal option for these 3 waste streams.) **However, about 10% of California hospitals currently manage most of their regulated medical waste on-site—they meet the same legal requirements for managing medical waste at half the cost.**

### Why are Municipalities Approaching Hospitals About Regulated Medical Waste Management?

In 1999 and 2000, several San Francisco Bay Area municipalities and the Executive Board of the Association of Bay Area Governments (ABAG) adopted resolutions calling for dioxins pollution prevention and dioxins elimination. The resolutions were motivated by concerns about the health and environmental effects of typical dioxins exposures as well as by the additional risks experienced by highly exposed Bay Area communities (such as neighbors of a regional medical waste incinerator). To meet the challenge of the resolutions—the elimination of dioxins formation—the municipalities initiated the San Francisco Bay Area Dioxins Project under the auspices of ABAG.

The San Francisco Bay Area municipalities participating in the Bay Area Dioxins Project are asking hospitals to rethink the way they manage their regulated medical waste because medical waste incineration is one of the nation's leading dioxins emissions

sources. To assist hospitals with considering the viable alternatives for medical waste management, the Bay Area Dioxins Project has compiled a set of materials for your use:

- Frequently Asked Questions—answers to common questions about autoclaving an acute care hospital's regulated medical waste
- Vendor List—autoclave vendors for general acute care hospitals in California
- Autoclaving Cost Estimate Worksheet—a detailed cost estimating interactive Excel spreadsheet for estimating the costs of on-site autoclaving of medical waste at a general acute care hospital
- Permit Requirements for Installing Autoclaves at Acute Care Hospitals—a list of steps and a checklist for permitting an on-site autoclave at an existing general acute care hospital
- Resources for Health Care Pollution Prevention—a list of the best available information for health care pollution prevention, mercury elimination, and evaluating medical waste treatment alternatives

## Dioxins—a Community Health Concern<sup>1</sup>

Dioxins are a family of complex, but related molecules with similar chemical structures. These highly toxic substances persist for long periods in the environment, where they bioaccumulate in living tissues. Nobody creates dioxins intentionally—they are waste byproducts of industrial processes like combustion, chemical manufacturing, and chlorine bleaching. While it appears that most dioxins are created by human activities, dioxins have been linked to a few natural sources, like certain ball clays and volcanoes.

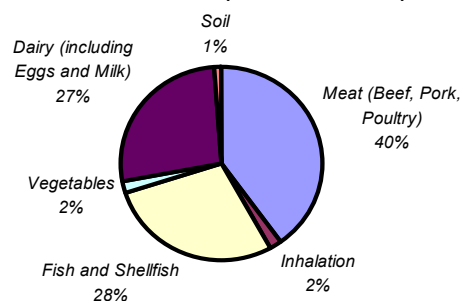
In humans, dioxins have the potential to cause cancer and to produce a broad spectrum of adverse effects, because they can alter the fundamental growth and development of cells. For example, dioxins can weaken the immune system and interfere with the endocrine system, which is responsible for making hormones needed to regulate bodily functions including sexual development and fertility. According to U.S. EPA, dioxins exposures in the general population are of great concern:

- Dioxins may be altering the biochemical processes in our bodies. (U.S. EPA does not know whether these changes have adverse effects on human health.)
- Dioxins cancer risks could exceed 1 in 1,000 for the general population (actual risks are likely to be lower).
- Many clearly adverse effects (such as impacts on immune system function and diabetes) may occur at concentrations that are less than 10 times the average dioxins exposure of the U.S. population.

In the U.S., more than 90% of the dioxins released to the environment are emitted to the air. Due to their chemical properties, dioxins released to the environment can travel far from their sources—dioxins emitted in California can affect the Arctic! Deposition of dioxins emissions on fields and gardens brings dioxins into the human food chain.

U.S. EPA estimates that the typical U.S. resident receives about 95% of his or her dioxins exposure from consumption of animal fats. A 1995 nationwide survey of the food supply using FDA estimates of food consumption in typical U.S. diets found that U.S. population dioxins exposures exceed current World Health Organization dioxins consumption guidelines. Happily, exposures are decreasing in response to government regulations and the decisions of dozens of businesses and institutions to eliminate dioxins-producing activities.

**Meat, fish, poultry, and dairy products provide most of the dioxins in a typical U.S. resident's diet (U.S. EPA, 2001)**



## Medical Waste Incineration is a Major Source of Dioxins And Many Other Air Pollutants

U.S. EPA's 1995 dioxins emissions inventory estimated that medical waste incineration was the nation's third largest dioxins source, emitting 15% of all the dioxins on the national inventory. The prevalence of chlorine-containing polyvinyl chloride (PVC) plastic products in medical waste is one contributor to dioxins formation—studies show that increasing the amount of chlorine or chlorine-containing PVC in a particular combustor (like a specific medical waste incinerator) increases its dioxins emissions. Diesel trucks hauling medical waste emit dioxins along the hauling route—a long one for most of Northern California's regulated medical waste, which is hauled to Salt Lake City, Utah for incineration.

<sup>1</sup>Information in this section is from the U. S. EPA *Exposure and Human Health Reassessment of 2,3,7,8-Tetrachlorodibenzo-p-Dioxin (TCDD) and Related Compounds*, draft September 2000 and *Database of Sources of Environmental Releases of Dioxin-like Compounds in the United States*, March 2001.

Medical waste incineration releases many other air pollutants that are problems for human health, like mercury, carbon monoxide, nitrogen oxides, sulfur oxides, hydrogen chloride, fine particulate matter, polycyclic aromatic hydrocarbons, cadmium, and lead. While incinerator closures and more stringent regulations should reduce medical waste incinerator pollutant emissions, these changes will only drive up incineration costs and increase transportation-related dioxins emissions as regulated medical waste is hauled increasing distances for incineration.

## Options for Treating Regulated Medical Waste

Nationally, the most common alternatives to incineration are autoclaves, microwaves, and chemical treatment units.

- Autoclaves are essentially large pressure cookers that use heat to kill pathogens. Steam creates the high pressure in the unit and conveys heat to the waste. About 10% of California hospitals have on-site autoclaves.
- Microwaves and radiofrequency irradiation units use irradiation to kill pathogens—the systems are somewhat analogous to home microwave ovens. Waste is usually shredded prior to such treatments. One California hospital has an on-site microwave.
- Chemical or mechanical/chemical treatment involves use of chemical biocides (disinfectants) to kill pathogens. Some such processes involve waste shredding prior to treatment and/or waste encapsulation after treatment.

*The California Department of Health Services has approved many alternative technologies for medical waste treatment (see the DHS web site: [www.dhs.ca.gov/medicalwaste](http://www.dhs.ca.gov/medicalwaste)) A recent (2001) review gives details about numerous alternatives to incineration—Non-Incineration Medical Waste Treatment Technologies, is free from Health Care Without Harm ([www.noharm.org/nonincineration](http://www.noharm.org/nonincineration)).*

Treated waste is usually compacted and sent to an ordinary landfill. Wastewater (condensed steam and biocide solutions) is usually discharged to the sewer system. Some treatment equipment has air emissions filters to prevent harmful emissions and/or odor control systems to eliminate nuisance odors.

Until recently, certain wastes—pharmaceuticals, chemotherapy, and pathological wastes—had to be incinerated under California law; however, these wastes (which must be managed separately anyway) are a very small fraction of regulated medical waste. In 2002, the California Department of Health Services began approving alternative treatment technologies for these waste streams (see the DHS web site: [www.dhs.ca.gov/medicalwaste](http://www.dhs.ca.gov/medicalwaste) for information on technologies and vendors).

When comparing regulated medical waste treatment costs, it is important to include all cost elements. Vendor treatment costs include transportation, treatment, disposal, taxes, and tipping fees; often these are combined into one price per pound. On-site treatment costs include equipment purchase, installation, operation, permitting, utilities, and disposal of residuals. (The “Autoclaving Cost Estimate Worksheet” can provide a detailed estimate for your hospital).

## Autoclaving—the Easiest Alternative

In California, most hospitals that do not incinerate regulated medical waste rely on the oldest and most widely accepted alternative—autoclaving. Autoclaves offer operational simplicity and permitting advantages to California hospitals treating medical waste on site. For Northern California hospitals seeking off-site waste treatment, the only currently available alternative is autoclaving. (The Vendor List identifies suppliers of on-site autoclaving equipment and off-site autoclaving services for Northern California hospitals.) Compared to incineration, autoclaving offers:

- Lower cost
- Relatively straightforward operation
- Reduced—but not zero—pollutant emissions to the air and to the sewer
- Excellent treatment efficacy with proper operation
- Residuals that are safer than ash—but that still look like medical waste
- Somewhat reduced worker safety hazards (primarily ergonomic hazards associated with moving the waste; however, heat stress and exposure to infectious agents may occur without proper management)<sup>2</sup>
- Relatively simple permitting and regulatory oversight
- Lower (but not zero) operating noise
- Odorous emissions that may need to be controlled
- Less—but nevertheless important—annual maintenance

<sup>2</sup> Units that shred waste prior to treatment involve additional worker safety hazards associated with air emissions and shredding equipment failures.

Initiating on-site treatment with an autoclave requires a capital investment in an autoclave, creating an appropriate physical location to install the autoclave unit (typically outdoors or on a loading dock near other waste management facilities), and obtaining appropriate permits. Routine autoclave operation is fairly simple and not exceptionally time consuming, as long as the unit is properly designed and maintained to ensure continued safe operation. (The Fact Sheet “Permit Requirements for Installing Autoclaves at Acute Care Hospitals” details the primary requirements for installing and operating an autoclave.)

## **Should a Hospital Treat its Regulated Medical Waste On Site?**

Although on-site treatment of medical waste can greatly reduce medical waste management costs, it is not for every hospital. On-site regulated medical waste treatment is a significant responsibility. Operating a treatment unit requires meaningful management oversight to ensure that wastes are safely managed in compliance with the Medical Waste Management Act, to protect worker safety, and to be prepared to respond to accidents, should they occur. Routine maintenance is essential to minimize downtime—as is a backup plan for autoclave down time. The hospital’s physical layout (considering possible operating noise and odorous emissions) and staffing must be able to accommodate the operation. For hospitals willing to take on this responsibility, the payoff includes cost savings, reduced accident risk (by eliminating off-site transport of untreated regulated medical waste), and the ability to ensure direct compliance with all elements of the Medical Waste Management Act.

Off-site medical waste treatment passes some responsibilities to a vendor—but at a price (about twice the cost of on-site treatment). The hospital has to count on an outside vendor to ensure the hospital’s compliance with the Medical Waste Management Act. Risks include accidents releasing the hospital’s regulated medical waste, vendor service interruptions, and vendors improperly treating wastes. Any hospital relying on off-site waste management services should routinely audit its vendor to minimize these risks.

## **Pollution Prevention and Proper Segregation of Medical Waste are The First Steps**

Prevention, recycling, and segregation are the first steps in waste management.

- Prevention involves reducing the amount of waste you make—after all, waste is lost resources and lost money.
- Recycling reuses unregulated wastes, to reduce resource use and keep wastes from polluting our environment.
- Segregation promotes compliance with medical waste management requirements, while keeping costly regulated medical waste to a minimum—and ensures that hazardous materials are managed safely.

These simple measures can save you money. For example, Beth Israel Medical Center in New York City reduced medical waste generation by a million pounds a year, saving the hospital \$600,000 per year in medical waste management costs. The University of Iowa Hospitals and Clinics reduced regulated medical waste volumes by 60%, saving \$400,000 per year—while reducing segregation violations by 80%. For hospitals considering on-site treatment of regulated medical waste, reducing waste volumes means that less expensive on-site treatment equipment can be purchased.

The main concepts in medical waste reduction are simple:

1. Keep solid wastes out of the medical waste stream. This involves thorough employee training and thoughtful placement of regulated medical waste containers (red bags) so that they don’t become trash bags.
2. Eliminate waste sources. Look for re-usable products (like sharps containers) and recycling opportunities for commonly mismanaged solid wastes (like blue wrap).

Waste reduction is so important that in 1998, the American Hospital Association (AHA) signed a memorandum of understanding with U.S. EPA with the goal of reducing waste 33% in all hospitals by 2005 and 50% by 2010. The resulting joint initiative—Hospitals for a Healthy Environment (H2E)—provides numerous resources for hospitals seeking to reduce regulated medical waste, mercury, and solid waste. (See Resources for Health Care Pollution Prevention for more information).

No matter which method is selected for treating regulated medical waste, proper segregation of hazardous and radioactive materials is essential for worker and environmental safety. Not only are these materials dangerous for workers handling waste, every medical waste treatment method release hazardous and radioactive materials to air, water, and land. For example, almost all of the mercury emitted from medical waste incinerators (which are one of the nation’s leading mercury emission sources) is from improperly disposed materials. Improper solvent disposal is a big problem for autoclaves—sewer authorities find “spikes” of solvents in autoclave discharges, due to incidents of improper segregation by facility customers.

## **About the Bay Area Dioxins Project**

More information about the Bay Area Dioxins Project is available on the Internet at <http://dioxin.abag.ca.gov/>